Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Stroke: hospital 30-day, all-cause, unplanned risk-standardized readmission rate (RSRR) following ischemic stroke hospitalization.

Source(s)

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific measures updates and specifications report: hospital-level 30-day risk-standardized readmission measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 112 p.

Measure Domain

Primary Measure Domain

Related Health Care Delivery Measures: Use of Services

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure estimates a hospital-level 30-day risk-standardized readmission rate (RSRR) for patients discharged from the hospital with a principal diagnosis of ischemic stroke. The outcome is defined as unplanned readmission for any cause within 30 days of the discharge date for the index admission. A specified set of planned readmissions do not count as readmissions.

The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for individuals who are 65 years and older and are Medicare Fee-for-Service (FFS) beneficiaries hospitalized in non-federal short-term acute care hospitals (including Indian Health Services hospitals) and critical access hospitals.

Rationale

Improvements in the quality of care for patients experiencing a stroke have the potential to lead to both

substantial improvements in patient quality of life and lower overall health care expenditures. The Centers for Medicare & Medicaid Services (CMS) has contracted with Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (YNHHSC/CORE) to develop hospital outcomes measures that reflect the quality of care delivered to patients who are hospitalized with stroke.

Hospital readmission, for any reason, is disruptive to patients and caregivers, costly to the healthcare system, and puts patients at additional risk of hospital acquired infections and complications. Hospital readmissions after stroke may result from the progression of disease, but may also be an indicator of poor care. Research has shown that readmission rates are influenced by the quality of inpatient and outpatient care, and that improvements in care, such as improved discharge processes, can reduce readmission rates (Jack et al., 2009; Naylor et al., 1999; Bravata et al., 2007). Given the high risk of readmission for patients following an ischemic stroke, measurement and reporting of stroke readmission rates will inform health care providers about opportunities to improve care and will strengthen incentives for quality improvement. Improved quality of stroke care has the potential to reduce readmissions, lower the cost of care associated with those readmissions, and improve patient outcomes.

Evidence for Rationale

Bravata DM, Ho SY, Meehan TP, Brass LM, Concato J. Readmission and death after hospitalization for acute ischemic stroke: 5-year follow-up in the medicare population. Stroke. 2007 Jun;38(6):1899-904. PubMed

Jack BW, Chetty VK, Anthony D, Greenwald JL, Sanchez GM, Johnson AE, Forsythe SR, O'Donnell JK, Paasche-Orlow MK, Manasseh C, Martin S, Culpepper L. A reengineered hospital discharge program to decrease rehospitalization: a randomized trial. Ann Intern Med. 2009 Feb 3;150(3):178-87. PubMed

Naylor MD, Brooten D, Campbell R, Jacobsen BS, Mezey MD, Pauly MV, Schwartz JS. Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. JAMA. 1999 Feb 17;281(7):613-20. PubMed

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research & Evaluation (CORE). Hospital 30-day readmission following acute ischemic stroke hospitalization measure: measure methodology report. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2010 Sep 29. 56 p. [22 references]

Primary Health Components

Ischemic stroke; 30-day readmission rate

Denominator Description

The measure cohort consists of admissions for Medicare Fee-for-Service (FFS) beneficiaries aged 65 years and older and discharged from non-federal acute care hospitals and critical access hospitals, having a principal discharge diagnosis of ischemic stroke.

The risk-standardized readmission rate (RSRR) is calculated as the ratio of the number of "predicted" readmissions to the number of "expected" readmissions at a given hospital, multiplied by the national observed readmission rate. For each hospital, the denominator is the number of readmissions expected based on the nation's performance with that hospital's case-mix.

See the related "Denominator Inclusions/Exclusions" field.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the measure cohort.

See the *2017 Condition-specific Measures Updates and Specifications Report: Hospital-level 30-day Risk-standardized Readmission Measures* for more details.

Numerator Description

The measure assesses unplanned readmissions to an acute care hospital, from any cause, within 30 days from the date of a discharge from an index ischemic stroke admission.

The risk-standardized readmission rate (RSRR) is calculated as the ratio of the number of "predicted" readmissions to the number of "expected" readmissions at a given hospital, multiplied by the national observed readmission rate. For each hospital, the numerator of the ratio is the number of readmissions within 30 days predicted based on the hospital's performance with its observed case-mix.

See the related "Numerator Inclusions/Exclusions" field.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the measure cohort.

See the *2017 Condition-specific Measures Updates and Specifications Report: Hospital-level 30-day Risk-standardized Readmission Measures* for more details.

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Stroke is a leading cause of morbidity for patients. It increases patients' likelihood of dependence on the healthcare system and is a condition that contributes greatly to the cost of healthcare in the United States (U.S.). There is good evidence of variation in readmission rates for stroke patients. For these reasons stroke is an important target for quality measurement and improvement initiatives.

Stroke is a priority area for outcomes measure development as it is a relatively common condition with potentially debilitating effects. Approximately 7 million Americans have experienced and survived a stroke (Roger et al., 2012). Stroke affects approximately 795,000 people each year in the U.S., and of these strokes, about 610,000 are first attacks and 185,000 are recurrent attacks (Roger et al., 2012). By 2030, it is projected than an additional 4 million people will have had a stroke, a 24.9% increase in prevalence from 2010 (Roger et al., 2012).

Stroke is a disease associated with high rates of preventable complications and discharge to settings with substantial requirements for ongoing care, e.g., home health or rehabilitation settings. Both of these factors provide numerous opportunities for potential readmissions, and, consequently, opportunities to reduce readmission rates with appropriate interventions and care decisions.

Extent of Measure Testing

Assessment of Updated Models

The stroke readmission measure estimates hospital-specific 30-day all-cause risk-standardized readmission rates (RSRRs) using a hierarchical logistic regression model. Refer to Section 2 in the original measure documentation for a summary of the measure methodology and model risk-adjustment variables. Refer to prior methodology and technical reports for further details.

The Centers for Medicare & Medicaid Services (CMS) evaluated and validated the performance of the models using the July 2013 to June 2016 data for the 2017 reporting period. They also evaluated the stability of the risk-adjustment model over the three-year measurement period by examining the model variable frequencies, model coefficients, and the performance of the risk-adjustment model in each year.

CMS assessed logistic regression model performance in terms of discriminant ability for each year of data and for the three-year combined period. They computed two summary statistics to assess model performance: the predictive ability and the area under the receiver operating characteristic (ROC) curve (c-statistic). CMS also computed between-hospital variance for each year of data and for the three-year combined period. If there were no systematic differences between hospitals, the between-hospital variance would be zero.

The results of these analyses are presented in Section 4.6 of the original measure documentation.

Stroke Readmission 2017 Model Results

Frequency of Stroke Model Variables

CMS examined the change in the frequencies of clinical and demographic variables. Frequencies of model variables were stable over the measurement period. The largest changes in the frequencies (those greater than 2% absolute change) include an increase in Renal failure (28.4% to 30.5%).

Stroke Model Parameters and Performance

Table 4.6.2 in the original measure documentation shows hierarchical logistic regression model variable coefficients by individual year and for the combined three-year dataset. Table 4.6.3 in the original measure documentation shows the risk-adjusted odds ratios (ORs) and 95% confidence intervals for the stroke readmission model by individual year and for the combined three-year dataset. Overall, the variable effect sizes were relatively constant across years. In addition, model performance was stable over the three-year time period; the c-statistic remained constant at 0.61.

Refer to the original measure documentation for additional information.

Evidence for Extent of Measure Testing

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific measures updates and specifications report: hospital-level 30-day risk-standardized readmission measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 112 p.

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Measurement Setting

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Age greater than or equal to 65 years

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Priority

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Not within an IOM Care Need

IOM Domain

Not within an IOM Domain

Data Collection for the Measure

Case Finding Period

Discharges July 1, 2013 through June 30, 2016

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Clinical Condition

Institutionalization

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
An *index admission* is the hospitalization to which the readmission outcome is attributed and includes admissions for patients:

- Having a principal discharge diagnosis of ischemic stroke* (Note: Hemorrhagic strokes are not included in the cohort.)
- Enrolled in Medicare Fee-for-Service (FFS) Part A and Part B for the 12 months prior to the date of admission, and enrolled in Part A during the index admission
- Aged 65 or over
- Discharged alive from a non-federal short-term acute care hospital
- Not transferred to another acute care facility

*International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes that define the ischemic stroke cohort for discharges on or after October 1, 2015:

- I163.00 Cerebral infarction due to thrombosis of unspecified precerebral artery
- I63.011 Cerebral infarction due to thrombosis of right vertebral artery
- I63.012 Cerebral infarction due to thrombosis of left vertebral artery
- I63.019 Cerebral infarction due to thrombosis of unspecified vertebral artery
- I63.02 Cerebral infarction due to thrombosis of basilar artery
- I63.031 Cerebral infarction due to thrombosis of right carotid artery
- I63.032 Cerebral infarction due to thrombosis of left carotid artery
- I63.039 Cerebral infarction due to thrombosis of unspecified carotid artery
- I63.09 Cerebral infarction due to thrombosis of other precerebral artery
- I63.10 Cerebral infarction due to embolism of unspecified precerebral artery
- I63.111 Cerebral infarction due to embolism of right vertebral artery
- I63.112 Cerebral infarction due to embolism of left vertebral artery
- I63.119 Cerebral infarction due to embolism of unspecified vertebral artery
- I63.12 Cerebral infarction due to embolism of basilar artery
- I63.131 Cerebral infarction due to embolism of right carotid artery
- I63.132 Cerebral infarction due to embolism of left carotid artery
- I63.139 Cerebral infarction due to embolism of unspecified carotid artery
- I63.19 Cerebral infarction due to embolism of other precerebral artery
- I63.20 Cerebral infarction due to unspecified occlusion or stenosis of unspecified precerebral arteries
- I63.211 Cerebral infarction due to unspecified occlusion or stenosis of right vertebral arteries
- I63.212 Cerebral infarction due to unspecified occlusion or stenosis of left vertebral arteries
- I63.219 Cerebral infarction due to unspecified occlusion or stenosis of unspecified vertebral arteries
- I63.22 Cerebral infarction due to unspecified occlusion or stenosis of basilar arteries
- I63.231 Cerebral infarction due to unspecified occlusion or stenosis of right carotid arteries
- I63.232 Cerebral infarction due to unspecified occlusion or stenosis of left carotid arteries
- I63.239 Cerebral infarction due to unspecified occlusion or stenosis of unspecified carotid arteries
- I63.29 Cerebral infarction due to unspecified occlusion or stenosis of other precerebral arteries
- I63.30 Cerebral infarction due to thrombosis of unspecified cerebral artery
- I63.311 Cerebral infarction due to thrombosis of right middle cerebral artery
- I63.312 Cerebral infarction due to thrombosis of left middle cerebral artery
- I63.319 Cerebral infarction due to thrombosis of unspecified middle cerebral artery
- I63.321 Cerebral infarction due to thrombosis of right anterior cerebral artery
- I63.322 Cerebral infarction due to thrombosis of left anterior cerebral artery

I63.329 Cerebral infarction due to thrombosis of unspecified anterior cerebral artery
I63.331 Cerebral infarction due to thrombosis of right posterior cerebral artery
I63.332 Cerebral infarction due to thrombosis of left posterior cerebral artery
I63.339 Cerebral infarction due to thrombosis of unspecified posterior cerebral artery
I63.341 Cerebral infarction due to thrombosis of right cerebellar artery
I63.342 Cerebral infarction due to thrombosis of left cerebellar artery
I63.349 Cerebral infarction due to thrombosis of unspecified cerebellar artery
I63.39 Cerebral infarction due to thrombosis of other cerebral artery
I63.40 Cerebral infarction due to embolism of unspecified cerebral artery
I63.411 Cerebral infarction due to embolism of right middle cerebral artery
I63.412 Cerebral infarction due to embolism of left middle cerebral artery
I63.419 Cerebral infarction due to embolism of unspecified middle cerebral artery
I63.421 Cerebral infarction due to embolism of right anterior cerebral artery
I63.422 Cerebral infarction due to embolism of left anterior cerebral artery
I63.429 Cerebral infarction due to embolism of unspecified anterior cerebral artery
I63.431 Cerebral infarction due to embolism of right posterior cerebral artery
I63.432 Cerebral infarction due to embolism of left posterior cerebral artery
I63.439 Cerebral infarction due to embolism of unspecified posterior cerebral artery
I63.441 Cerebral infarction due to embolism of right cerebellar artery
I63.442 Cerebral infarction due to embolism of left cerebellar artery
I63.449 Cerebral infarction due to embolism of unspecified cerebellar artery
I63.49 Cerebral infarction due to embolism of other cerebral artery
I63.50 Cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebral artery
I63.511 Cerebral infarction due to unspecified occlusion or stenosis of right middle cerebral artery
I63.512 Cerebral infarction due to unspecified occlusion or stenosis of left middle cerebral artery
I63.519 Cerebral infarction due to unspecified occlusion or stenosis of unspecified middle cerebral artery
I63.521 Cerebral infarction due to unspecified occlusion or stenosis of right anterior cerebral artery
I63.522 Cerebral infarction due to unspecified occlusion or stenosis of left anterior cerebral artery
I63.529 Cerebral infarction due to unspecified occlusion or stenosis of unspecified anterior cerebral artery
I63.531 Cerebral infarction due to unspecified occlusion or stenosis of right posterior cerebral artery
I63.532 Cerebral infarction due to unspecified occlusion or stenosis of left posterior cerebral artery
I63.539 Cerebral infarction due to unspecified occlusion or stenosis of unspecified posterior cerebral artery
I63.541 Cerebral infarction due to unspecified occlusion or stenosis of right cerebellar artery
I63.542 Cerebral infarction due to unspecified occlusion or stenosis of left cerebellar artery
I63.549 Cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebellar artery
I63.59 Cerebral infarction due to unspecified occlusion or stenosis of other cerebral artery
I63.6 Cerebral infarction due to cerebral venous thrombosis, nonpyogenic
I63.8 Other cerebral infarction
I63.9 Cerebral infarction, unspecified
I67.89 Other cerebrovascular disease

Note: International Classification of Diseases, Ninth Revision (ICD-9) code lists for discharges prior to October 1, 2015 can be found in the *2016 Condition-specific Measures Updates and Specifications Report: Hospital-Level 30-Day Risk-Standardized Readmission Measures*.

Exclusions

Without at least 30 days of post-discharge enrollment in Medicare FFS
Discharged against medical advice
Ischemic stroke admissions within 30 days of discharge from a prior ischemic stroke index admission.

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
The measure assesses unplanned readmissions, from any cause, within 30 days from the date of discharge from an index ischemic stroke admission.

If a patient has more than one unplanned admission within 30 days of discharge from the index admission, only the first is considered a readmission. The measures assess a dichotomous yes or no outcome of whether each admitted patient has any unplanned readmission within 30 days. If the first readmission after discharge is planned, any subsequent unplanned readmission is not considered in the outcome for that index admission because the unplanned readmission could be related to care provided during the intervening planned readmission rather than during the index admission.

The risk-standardized readmission rate (RSRR) is calculated as the ratio of the number of "predicted"

readmissions to the number of "expected" readmissions at a given hospital, multiplied by the national observed readmission rate. For each hospital, the numerator of the ratio is the number of readmissions within 30 days predicted based on the hospital's performance with its observed case-mix.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the outcome.

See the *2017 Condition-specific Measures Updates and Specifications Report: Hospital-level 30-day Risk-standardized Readmission Measures* for more details.

Exclusions
Admissions identified as planned by the planned readmissions algorithm are not counted as readmissions. The planned readmission algorithm is a set of criteria for classifying readmissions and planned among the general Medicare population using Medicare administrative claims data. The algorithm identifies admissions that are typically planned and may occur within 30 days of discharge from the hospital.

The planned readmission algorithm has three fundamental principles:

A few specific, limited types of care are always considered planned (transplant surgery, maintenance chemotherapy/immunotherapy, rehabilitation);
Otherwise, a planned readmission is defined as a non-acute readmission for a scheduled procedure; and
Admissions for acute illness or for complications of care are never planned

The planned readmission algorithm uses a flow chart and four tables of specific procedure categories and discharge diagnosis categories to classify readmissions as planned. The flow chart and tables are available in the *2017 Condition-specific Measures Updates and Specifications Report: Hospital-level 30-day Risk-standardized Readmission Measures*.

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Proxy for Outcome

Instruments Used and/or Associated with the Measure

Planned Readmission Algorithm Version 4.0 (ICD-10) Flowchart

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a lower score

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

Risk-Adjustment Variables

In order to account for differences in case mix among hospitals, the measure adjusts for variables (for example, age, comorbid diseases, and indicators of patient frailty) that are clinically relevant and have relationships with the outcome. For each patient, risk-adjustment variables are obtained from inpatient, outpatient, and physician Medicare administrative claims data extending 12 months prior to, and including, the index admission.

The measure adjusts for case mix differences among hospitals based on the clinical status of the patient at the time of the index admission. Accordingly, only comorbidities that convey information about the patient at that time or in the 12 months prior, and not complications that arise during the course of the hospitalization, are included in the risk adjustment.

The measure does not adjust for socioeconomic status (SES) because the association between SES and health outcomes can be due, in part, to differences in the quality of health care that groups of patients with varying SES receive. The intent is for the measures to adjust for patient demographic and clinical characteristics while illuminating important quality differences.

Refer to Appendix D of the original measure documentation for the list of comorbidity risk-adjustment variables and the list of complications that are excluded from risk adjustment if they occur only during the index admission.

Standard of Comparison

not defined yet

Identifying Information

Original Title

Hospital-level 30-day RSRR following ischemic stroke.

Measure Collection Name

National Hospital Inpatient Quality Measures

Measure Set Name

Submitter

Centers for Medicare & Medicaid Services - Federal Government Agency [U.S.]

Developer

Centers for Medicare & Medicaid Services - Federal Government Agency [U.S.]

Yale-New Haven Health Services Corporation/Center for Outcomes Research and Evaluation under contract to Centers for Medicare & Medicaid Services - Academic Affiliated Research Institute

Funding Source(s)

Centers for Medicare & Medicaid Services (CMS)

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This measure was developed by a team of experts:

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Financial Disclosures/Other Potential Conflicts of Interest

None

Measure Initiative(s)

Hospital Compare

Hospital Inpatient Quality Reporting Program

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2017 Mar

Measure Maintenance

Annual

Date of Next Anticipated Revision

2018 Apr

Measure Status

This is the current release of the measure.

This measure updates a previous version: Specifications manual for national hospital inpatient quality measures, version 5.0b. Centers for Medicare & Medicaid Services (CMS), The Joint Commission; Effective 2015 Oct 1. various p.

Measure Availability

Source available from the QualityNet Web site .

Check the QualityNet Web site regularly for the most recent version of the specifications manual and for the applicable dates of discharge.

Companion Documents

The following are available:

Hospital compare: a quality tool provided by Medicare. [internet]. Washington (DC): U.S. Department of Health and Human Services; [accessed 2017 Oct 30]. Available from the Medicare Web site .

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 Medicare hospital quality chartbook. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017. Available from the Centers for Medicare & Medicaid Services (CMS) Web site .

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific readmission measures updates and specifications report: supplemental ICD-10 code lists for use with claims for discharges on or after October 1, 2015. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017. Available from the QualityNet Web site .

NQMC Status

This NQMC summary was completed by ECRI Institute on December 5, 2014. The information was verified by the measure developer on January 21, 2015.

This NQMC summary was updated by ECRI Institute on July 21, 2015. The information was verified by the measure developer on September 23, 2015.

This NQMC summary was updated again by ECRI Institute on November 13, 2017. The information was verified by the measure developer on December 12, 2017.

Copyright Statement

Production

Source(s)

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific measures updates and specifications report: hospital-level 30-day risk-standardized readmission measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 112 p.

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